$$MSE(\hat{\theta}) = E\left[(\hat{\theta}-\theta)^2\right]$$

$$= E\left[\{\hat{\theta} - E(\hat{\theta}) + E(\hat{\theta}) - \theta\}^2\right]$$

$$= E\left[\{\hat{\theta} - E(\hat{\theta})\}^2 + 2\{\hat{\theta} - E(\hat{\theta})\}\{E(\hat{\theta}) - \theta\} + \{E(\hat{\theta}) - \theta\}^2\right]$$

$$= E\left[\{\hat{\theta} - E(\hat{\theta})\}^2\right] + 2\{E(\hat{\theta}) - \theta\}E\left[\hat{\theta} - E(\hat{\theta})\right] + \{E(\hat{\theta}) - \theta\}^2$$

$$= Var(\hat{\theta}) + 2\{E(\hat{\theta}) - \theta\}\{E(\hat{\theta}) - E(\hat{\theta})\} + \{Bias(\hat{\theta})\}^2$$

$$= Var(\hat{\theta}) + \{Bias(\hat{\theta})\}^2$$